

## **DETERMINING FACTORS OF CLOUD COMPUTING FOR SMALL AND MEDIUM ENTERPRISES (SMEs)**

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**ABSTRACT** - The purpose of this paper is investigating the factors which have an impact Cloud computing solutions with the Small and Medium-size Enterprises (SMEs) in the Emerging Markets and would also support its adoption. The cloud computing is not a trend anymore, instead it became a significant tool for numerous organizations. It is helpful for the organizations for outsourcing their IT, rather than having it done in-house. The study revealed a significant buffering impact of the skills of human resources, senior management support, security, Control Spending and competitive pressures for the cloud computing adoption, using a sample of 250 SMEs (Made-up textile articles other than apparel (8), Bakery products (96), and Structural metal products making (146)) from the private sector.

**Keywords:** IT human resource skills, Complexity, security, Control Spending, Competitive pressure, Cloud computing adoption, SMEs.

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### **I. INTRODUCTION**

In the highly globalized economy of the present days, the SMEs are often feeder industries for larger ones, and they're necessary for the economic development and growth [16]. Nowadays, the SMEs are viewed as the main innovation, flexibility and dynamism source in the developing and emerging countries, in addition to economies of the majority of the nations. The SMEs kept being a possible economic backbone of numerous areas and played an important role in the employment in comparison with other large organizations[5].Iraq is in need of diversifying its economic base and grow through increased international trade levels. The oil industry is dominating in the Iraqi economy, as it provides more than 90% of the governmental revenue and 80% of the earnings of the foreign exchanges. None-the-less, for the peaceful and sustainable future developments a more diversified economic base is necessary. One of those developments includes promoting the SMEs, in addition to general developments in private sector and promoting private investments. Considering to have the correct environment, the SMEs may be a sustainable and vibrant employment source for the men as well as the women. They present essential profits for the business owners as well as the workers and their families, and present therequired products and services. The SMEs increase the value of economy via mobilizing the foreign and domestic investments.

It was interesting to observe from early reviews that SMEs are responsible for over 99% of the total organizations within the country. The evidences have suggested the fact that the SMEs have a significant impact on the well-being and economy of the nation. The highest SMEs' concentration, according to the numbers, may be discovered in apparel and textile sectors, followed by the beverages and food, metals and its products, and wood and its products [11]. SMEs' promotion has been considered as one of the significant issues in numerous countries[11],due to the fact that it holds mush responsibility to provide additional economy conversion and employment. It's implicit as well that the sectors that have been

conquered by the SMEs are more capable of developing dynamic economies of the scale [14]. Due to the fact that the SMEs produce a base for the economic developments in the country, the researches that are linked to that area are of high importance for enabling the stakeholders and researchers in improving their expertise and knowledge in SME management [11].

IT significantly influences the firms' productivity. Those impacts will only be entirely realized in the case where the IT are widespread and commonly used. Which is why, it is necessary, to understand IT adoption determinants as well as theoretical models, addressing the adoption of the IT. The cloud computing is in the first adoption stages and it is representing a good option for the companies, users, and the market in numerous countries [30]. In one of the surveys carried out by Coleman Parkes Research amongst the executives from numerous countries, more than 80% of respondents believed that the impacts of the Cloud computing on technological developments will be at least as significant as the virtualization, or Internet has been [6]. [30] highlighted the cloud computing as one of the topics for additional researches. A variety of the studies that have been carried out in the international as well as the national data-bases, and some papers adopted an academic method that has been directed toward the business management, with most of them being concerned with the computer sciences. Which has favoured the developments of researches, involving the cloud computing in Information Systems (IS) area. [19] Have researched factors that are associated with adopting and implementing the Cloud computing, due to the fact that the organizations are in a constant search for the 'roadmaps' for adopting new technologies.

Cloud Computing can be considered as a concept shift in the IT service delivery, which has promised large gains in the agility, flexibility and efficiency in a certain time in the case where the demands on the data centers witness exponential growth [13]. The academic researchers have suggested that the full potential of the cloud will eventually exceed the expectations of the IT [12]. The cloud computing is demanding a deep understanding of the business needs, in combination with the multi-domain expertise, allowing the companies in designing, building and operating high efficiency IT infrastructures, which include the legacy infrastructures that are tightly aligned with the business priorities [31]. The infrastructures of the Cloud have to be seamlessly integrated with existing environment in addition to leverage rigorous automation for driving the value to enterprise.

Presently, numerous of the SMEs have interest in the use of the cloud computing concepts and abilities, however, they don't know where to be expecting the changes with the use of the cloud computing [15]. Options which may can decrease cost, as well as Manpower needs for the firms is using centralized computing resources that have been provided as cloud computing. According to [21], there is a lack of awareness among the SMEs for cloud computing services in terms of cost and benefits of implementing upon the establishment. SMEs, particularly allow customer change company in their business operation. Hence, it is very essential that there is a good model available for cloud computing. Thus, this study has been focused on implementation of cloud computing in the SMEs. This research attempts at providing a proper road-map that will provide the organizations to be developing better approaches for the projects of Cloud computing adoptions.

## **1.1 SME IN IRAQ**

During the last 30 years, Iraqi economy has suffered as a result of the expensive militarization, 3 wars in a row, pervasive state interventions as well as more than 10 years of the restricted international sanctions. Therefore, the Iraqi Gross Domestic Product (GDP) per capita has been estimated to drop from more than \$3600 in early 1980's to about \$700 - \$1000 in 2001. Which is why, the economic diversification has been important in the long term, even if the oil sector significant in the provision of the bases for the stability and growth

at present. Iraq has a long history of trading, and the long-term future is dependent on the reintegration of Iraq in the global system of trading. Which is why, the government has been pursuing an approach for gaining foreign investments in the Iraqi economy. Which necessitates developing the Venture Capital Funds and SMEs as climbing steps for the Iraqi economy as well as removing key bottlenecks to investments and trade.

The SMEs apart from being the largest employment provider in the majority of the countries is still one of the main sources of the new products and technological innovations. In Iraq, the unfavourable environment was prevailing throughout the years and the lack in the institutional supports resulted in impeding their success and development. None-the-less, presently, the outlooks for stable economy with the long-term prospects of growth is positive. The significance of the SMEs in re-building the Iraqi economy, and the potentials for the SME finances, has been underscored by: the overall data on the credit as well as other available signs clearly show that there is a low accesses to the credit in Iraq. Even though rapidly growing, the credits to economy only amounts to 10% of the GDP, in comparison with 55% for MENA region.

A 2005 ILO estimation has put total number of the registered SMEs with three employees or more at 622000. Additional 719000 SMEs have been registered as self-employed. An additional 1 million SMEs have not been registered based on ILO estimation. The team of the AUSAID Project estimated that <5% of SMEs in formal sector have ever received a bank loan and that less than 10% of them include a bank account [24].

## **1.2 CLOUD COMPUTING FOR SME**

Presently, the cloud computing is an emerging trend in the business and technology. The cloud computing is universal, and thereby, it offers a possibility for everybody, at any place. The popularity of this term in combination with its potentials had resulted in the generation of the literature and discussions all over the world. The main subjects that are under the cloud computing were researched and studied by various authors and writers [3][19][20][33], however, quite a small number of the literatures were attributed to developing economies. Various working cloud computing definitions were suggested by organizations as well as individuals.

The cloud services permit modifications of the IT services for changing the client and business needs. The allocated capacity and resources have been driven by the demands as and when required. In addition to that, the cloud computing allows quicker deployments of the IT services, some of them may be provisioned in hours and made it easier for the enterprises to rapidly scale their services and automatically to a variety of the peaks with the minimum interventions from the service providers. The cloud computing may as well bring about the decreased utility cost savings in addition to the low emissions of the carbon.

There are significant organizational factors in adopting the cloud computing which raises concerns to organizations. They're concerned with value as well as the migration of the systems/applications to Cloud for the purpose of satisfying and meeting the requirements of the organization, compliance and legal matters, SLAs as well as other costs faced by the organizations to make a decision toward the Cloud computing [2]. Utilizing the a cloud service will result in lowering capital investments as well as the required expenses, however, the provision of the services are carried out in the real-time. based on[25], the main cloud service drivers are: anytime / anywhere accessibility to the cloud based software, cloud enabled storage as ubiquitous services, customization and specialization applications, collaborations amongst the users and cost advantages which are predicted on the cloud efficiencies, energy efficiency,warehouse-size data centres, and everything as a service.

## **1.3 TECHNOLOGICAL CONTEXT WITH CLOUD COMPUTING**

The firm is expected to benefit as a result of certain technology driven to practice because the appreciation of an employee is relative advantage lift systems to increase work efficiency. Has the advantage to increase efficiency in providing services for cloud computing? The relative advantages of cloud computing service implementations can enhance the speed of business communication, efficient coordination amongst the organizations, client communication and accesses to the market information mobility [3]. The results of that study have shown that respondents have been aware of relative cloud computing benefits. None-the-less, their lacking in the knowledge on cloud concepts have proven to be one of the main drawbacks toward making decisions that pertain the adoptions. Although relative advantage has been clear to the majority of respondents, they have cited the costs of the implementation is rather high. Which is why, this research has been in consistence with [28]that have stated that the costs of the implementation of the new systems of technology, the costs of actual systems may be rather increased and usually represent one of the main barriers to their adoptions. The suggested cloud service complexities and compatibility have been as well concern points by numerous of the respondents. Control Spending and Security were measured scale developed by [10].

H1: Security will have a positive effect on the adoption of the cloud computing.

H2: Control Spending will have a positive impact upon the adoption of the cloud computing.

#### **1.4 ORGANIZATIONAL CONTEXT WITH CLOUD COMPUTING**

The Complexity has been discovered as one of the most important factors in cloud adoptions. The earlier study has discovered that the complexity has not been willing to be investing the resources to the new technology in the case where there's an available and working technology. None-the-less, the unwillingness of some of the managers for the adoption has been due to the brief knowledge that they have on the cloud computing. They have stated the fact that it's a new technology, which is why "wait and see" method has been optimal for them. Those results have been in consistency with [18]works, who have discovered that without the Complexity, the SMEs have lower likelihood for adopting the new technologies.

The small companies have expressed their desires as well for the adoption of the technology where as the larger companies have been less willing to accept the changes. Which may be because the decision making becomes easier in the small companies instead of tedious and long protocol based decision-making processes in the large companies. The results of the present study agree with [17], who have stated the fact that the organizational readiness and competency can be helpful for leveraging the existing applications of information technology and data resources over the key procedures in value chain in the case where firms embedded cloud computing services. The Skill and complexity of the IT Human Resources have been assessed with the scale that has been developed by [10].

H3: Complexity will have positive effects on the adoption of the cloud computing.

H4: Skill of IT human resource will have positive effects on the adoption of the cloud computing.

#### **1.5 ENVIRONMENTAL CONTEXT WITH CLOUD COMPUTING**

Competitive pressures and Trading partner have had an important impact on the determination of whether or not to be adopting the cloud computing. From the results of the earlier researches, it has been noticed that the environmental contexts have been affected by the business nature. For instance, the impacts of the environmental contexts on the organizations that are involved in the manufacturing have been different compared to the ones that are involved in the services industry. Which results from the fact that the firms on the same business activity have been competing against one another. In the case where one hasn't embraced the technology, then the others didn't find the solid reasons for adopting the cloud computing. None-the-less, in the case where they have been pressurized by the competition, they have aggressively adopted those technologies swiftly. That finding has been in consistency with some previous researches from [23] [32], implying that in the case where the firms have been faced with intense competitions, they had the tendency of implementing changes in a more aggressive manner. Competitive Pressure was measured with scale developed by [29].

H5: Competitive pressure will have positive effects upon the adoption of the cloud computing.

## II. RESEARCH FRAMEWORK

In the literature of the innovation diffusion, the researches utilized a variety of the theories for studying adoptions of the technologies. None-the-less, the majority of theories have been focused on adoption decisions of the individuals, thereby they only provide partial explanation for the organizational adoptions[22]. As this study has been focused on adoption decisions by the SMEs, individual-level theory is unsuitable. Amongst the organizational-level schemes, Diffusion of Innovations (DOI) theory [26]has attempted at the evaluation of a variety of the factors that are responsible for the adoption of the Technology, which include the organizational, technological, and environmental properties [27]. None-the-less, this theory has been focused upon a variety of the technological innovation stages which have considered and clearly distinguished between all of those 3 aspects (i.e. organizational, environmental, and technological) for the investigation of the firm-level adoptions.

The technological contexts include the external / internal technologies that are associated with the organization; the organizational context indicates the descriptive firm features, which include the size of the firm, the slack resource amounts that are internally available as well as the degree and the quality of its human sources; environmental context indicates the arena where a firm can conduct its business, its industry, and dealings with the government and competitors.

It was observed that the results of the study on the adoption of the technology the by large organizations can't be generalized to medium and small firms [9]. Which is why, for the purpose of identifying the components of the construct in the framework of the TOE, the technology adoption literature review in the medium and small organizations has been carried out, and numerous aspects have been characterized. In this study, only the factors relevant and consistently cited for studying skills of IT human resource, Complexity, Security, Control Spending, and Competitive Pressure in the context of SEMs were retained. To summarize, Security and Control Spending were identified in the technological context [7][8]. Skills of IT human resource, and Complexity were identified in the organizational context [4], and Competitive Pressure was identified in the environmental context [1] [7].

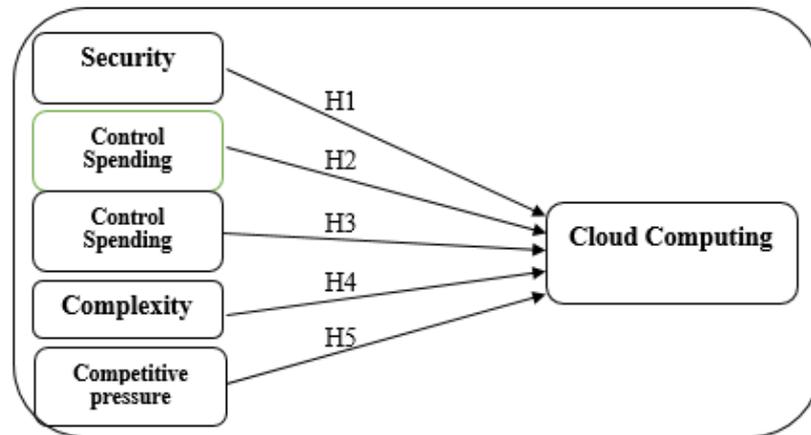


Figure 1: Conceptual Model for adopting the cloud computing in SMEs

### III. METHODOLOGY

This research employed qualitative techniques to investigate factors which could possibly have an impact on the adoption of the cloud computing for the SMEs. For this study, the sectors such as transformation manufacturing, textile manufacturing, and fabricated metal products except machinery and equipment were selected as these sectors play a role important aspect in the economy compared to other SME sectors. A total of 377 questionnaires have been distributed, and 334 filled questionnaires were received back from respondents. After checking about 84 questionnaires were eliminated due to the fact that there have been too many missing values and false data. Hence, the final number of the valid responses has been 250, which accounted to a 66.3% response rate.

The current study parts. The first part comprised of demographic questions about the used the earlier researches' inventories of the items of the questionnaire. The questionnaire consisted of two respondent such as age, gender, education background, etc. The 2nd part was divided to 5 elements. The questionnaires were given a 5-point Likert Scale that ranges from 1 (i.e. Strongly disagree), 2 (i.e. Disagree), 3 (i.e. Neutral), 4 (i.e. Agree), 5 (i.e. Strongly Agree) for the respondents to fill in their opinion.

**Table1:** SME's in Iraq

Total SME's in Iraq	No.
Mining and quarrying	3
Transformation manufacturing	7350
Textile manufacturing	419
Ready clothes	4441
Leather, leather products and footwear	64
Wood and wood products; furniture	1049
Paper manufacturing	2
Paper products manufacturing	100
Coke oven products, refined petroleum products, nuclear fuel	4
Chemical product manufacturing	59
Plastic and rubber manufacturing products	23
Non-metallic mining manufacturing	3102
Basic metals manufacturing	275
Fabricated metal products except machinery & equipment	15903
Machinery & equipment n.e.c.	20
Electric machinery & appliances n.e.c.	1
Medical, surgical, orthopaedic equipment and &all kinds of watches and	9
Other transport equipment	12
Furniture and products n.e.c.	10831
Total	43669

### 3.1 CORRELATIONS, MEAN, STANDARD DEVIATION AND RELIABILITY

The results of the correlation from Table2 have shown that the Security ( $r = 0.632$ ,  $p < 0.01$ ), Control Spending ( $r = 0.439$ ,  $p < 0.01$ ), Complexity ( $r = .555$ ,  $p < 0.01$ ), Skill of IT human resource ( $r = 0.632$ ,  $p < 0.01$ ) and Competitive pressures ( $r = 0.151$ ,  $p < 0.05$ ) are significantly and positively related to cloud computing adoption. Table2 has shown as well the mean, standard deviation and reliability of independent and dependent variables.

**Table2: Correlations, Standard Deviation, Mean and Reliability**

	Mean	Std. Deviation	S	CS	C	SHR	CP	ACC
<b>S</b>	2.4633	.39807	<b>(0.703)</b>					
<b>CS</b>	2.5411	.41963	.933**	<b>(0.720)</b>				
<b>C</b>	2.8733	.44021	.702**	.737**	<b>(0.730)</b>			
<b>SHR</b>	2.4580	.39451	.982**	.950**	.698**	<b>(0.702)</b>		
<b>CP</b>	3.3373	.65552	.443**	.642**	.756**	.449**	<b>(0.792)</b>	
<b>ACC</b>	<b>2.7884</b>	<b>.48066</b>	<b>.632**</b>	<b>.439**</b>	<b>.555**</b>	<b>.632**</b>	<b>.151*</b>	<b>(0.744)</b>

Note: N = 250, SHR = Skill of IT Human Resource, C = Complexity, S = Security, CS = Control Spending, CP = Competitive pressure, ACC = Adoption of Cloud Computing

### 3.2 CONTROL VARIABLES

One-way ANOVA was utilized for examining the mean differences between 2 or several groups. The results of One-way ANOVA showed that demographic variables (Gender, Age, Education, Size of Organization, Working Experience, and Type of SME) significantly influenced the dependent variables (Cloud computing adoption). Table 3 presented below lists One-way ANOVA results. According to the results below, prior to carrying out regression analyses, the present research has regulated the demographic effects upon the dependent variables.

**Table3: One-Way ANOVA**

Demographic Variables	F	Sig
Gender	18.008	.000
Age	10.487	.000
Education	10.975	.000
Size of Organization	22.084	.000
Working Experience	18.344	.000
Type of SME	9.792	.000

### 3.3 HYPOTHESES ANALYSIS

This research focused on identifying the relationship between Security, Control Spending, Complexity, Skill of IT human resource, and Competitive pressure towards adopting cloud computing through the test of Hypotheses, which were H1, H2, H3, H4, and H5. Appropriate statistical methods were used to test the significance between the dependent variable and the independent variable. Table 4 shows the liner regression results between dependent as well as independent variables.

**Table 4: Results of Regression Analysis: Security and cloud computing adoption**

Model	S			CS			C			SHR			CP		
	$\beta$	R <sup>2</sup>	Sig												
ACC	.618	.606	.000	.489	.472	.000	.556	.546	.000	.621	.611	.000	.238	.295	.000

Note: N = 250, SHR = Skill of IT Human Resource, C = Complexity, S = Security, CS = Control Spending, CP = Competitive pressure, ACC = Adoption of Cloud Computing

The regression analysis as given in Table 4 showed that the correlation between security and cloud computing adoption as 60.6% (R<sup>2</sup> = 0.606, p < 0.001). Furthermore, regression analysis showed that security is significantly and positively ( $\beta$  = 0.618, p < 0.001) related with cloud computing adoption. Therefore, the research hypothesis is accepted.

The second regression testing is between Control Spending and cloud computing adoption. Where 47.2% (R<sup>2</sup> = 0.472, p < 0.001) variation in cloud computing adoption was explained by Control Spending. The regression analysis results also showed that Control Spending is significantly and positively ( $\beta$  = 0.489, p < 0.001) related with cloud computing adoption.

The third regression testing showed that Complexity is significantly and positively ( $\beta$  = 0.556, p < 0.001) related with cloud computing adoption. Where 54.6% (R<sup>2</sup> = 0.546, p < 0.001) variation in cloud computing adoption was explained by Complexity.

The fourth regression testing is between skills of IT human resource and cloud computing adoption. From the results of regression analysis it is clear that skills of IT human resource is significantly and positively ( $\beta$  = 0.621, p < 0.001) related with cloud computing adoption. Where 61.1% (R<sup>2</sup> = 0.611, p < 0.001) variation in cloud computing adoption was explained by skills of IT human resource.

Using regression testing, all hypotheses were supported to explain the adoption model for SMEs in Iraq. This research also discussed the similarity between each data and found that most of the SMEs prefer for the adoption model in Iraq to increase the quality of service and production. In the same time, it is reliable and effective within less cost for the other discussions.

### IV. Conclusion

In this research, adoption of successful cloud computing is considered. Cloud computing is defined as a new model of computing where online accesses to services such as software and data-storage applications are available. Cloud Computing systems are

incorporated in SMEs in Iraq. This study also aimed to find the impact of factors that supported the adoption of cloud computing in SMEs. Cloud is a relatively new phenomenon that has the great potential to reduce the costs of business processes, increase efficiency and providing resources that in turn will benefit the business model at a lower cost for each model depending on the demands of every SMEs. The goals of SMEs are to maximize profits, provide the resources by cloud computing that are very useful to expand and improve the welfare of the companies' employees, and provide high customer service. However, there are some SMEs that are still reluctant to use and benefit from broadband services; and some of the SMEs do not understand the potential benefits of cloud computing due to the lack of awareness and security. This study makes four significant contributions to the field of SMEs:

- An evaluation of readiness for SMEs from a number of various perspectives, including social and technical in Iraq.
- Determine of any matters, which might prevent the utilize and spread of adoption of cloud computing in Iraq, for example, lack of fund, lack of training, poor infrastructure and improve electricity, which is one of the biggest problems that guided the adoption of cloud computing in Iraq.
- The development of two guideline frameworks for decision makers in Iraq that can be utilized to help the conception and execution of cloud computing in Iraq, and that can be adapted for another developing county.
- Prime efforts at creating awareness of these guideline frameworks in Iraq and promoting their utilization with key decision makers.

**Acknowledgments:** The authors would like to thanks Mustansiriyah University ([www.uomustansiriyah.edu.iq](http://www.uomustansiriyah.edu.iq)) Baghdad-Iraq for its support in the present work.

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